

# Schwartzembergite

# $\text{H}_2\text{Pb}_5\text{I}^{3+}\text{O}_6\text{Cl}_3$

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**Crystal Data:** Tetragonal. *Point Group:*  $4/m\ 2/m\ 2/m$ . Crystals are flat pyramidal, rounded, to 5 mm; in earthy to compact masses and crusts.

**Physical Properties:** *Cleavage:* Distinct on {001}. *Hardness* = 2–2.5 *D*(meas.) = 5.7–7.09 *D*(calc.) = 5.72

**Optical Properties:** Semitransparent. *Color:* Honey-yellow, straw-yellow, lemon-yellow, yellowish brown, reddish brown. *Streak:* Straw-yellow. *Luster:* Adamantine. *Optical Class:* Uniaxial (–), anomalously biaxial (–).  $\omega = 2.36$  (Li)  $\epsilon = 2.25$   $\alpha = 2.25(2)$  (Li)  $\beta = 2.35(2)$   $\gamma = 2.36(2)$   $2V$ (meas.) =  $12^\circ$

**Cell Data:** *Space Group:*  $I4/mmm$ .  $a = 3.997(1)$   $c = 12.566(4)$   $Z = 1$

**X-ray Powder Pattern:** Santa Ana mine, Chile.  
2.880 (10), 1.633 (9), 2.806 (8), 2.091 (7), 3.782 (6), 1.986 (6), 1.262 (6)

<b>Chemistry:</b>	(1)	(2)	(3)	(4)
$\text{SO}_3$	0.47			
$\text{I}_2\text{O}_3$	10.27	15.99	11.20	11.04
$\text{PbO}$	80.90	76.34	81.13	81.62
$\text{CaO}$	0.67			
$\text{Cl}$	7.95	8.05	7.95	7.78
$\text{H}_2\text{O}$	n.d.	2.44	1.20	1.32
$-\text{O} = \text{Cl}_2$	1.79	1.82	1.79	1.76
<b>Total</b>	<b>98.47</b>	<b>101.00</b>	<b>99.69</b>	<b>100.00</b>

(1) San Rafael mine, Chile; here converted to oxides, original total 99.95%. (2) Santa Ana mine, Chile; here converted to oxides, original total 101.48%. (3) San Rafael mine, Chile; by electron microprobe, average of 24 analyses,  $\text{H}_2\text{O}$  by hydrogen line extraction; corresponds to  $\text{H}_{1.86}\text{Pb}_{4.86}\text{I}_{1.04}\text{O}_6\text{Cl}_{3.13}$ . (4)  $\text{H}_2\text{Pb}_5\text{IO}_6\text{Cl}_3$ .

**Occurrence:** A rare secondary mineral formed in the oxidized zone of hydrothermal polymetallic deposits in an arid climate.

**Association:** Cerussite, anglesite, paralaurionite, boleite, seeligerite.

**Distribution:** In Chile, in Antofagasta, from Cachinal, between Paposá and Taltal; at the San Rafael, Santa Ana, and San Francisco (Beatriz) mines, near Caracoles, Sierra Gorda district, southwest of Calama; from Challacollo, Tarapacá.

**Name:** Honors Dr. Schwartzemberg [probably Dr. Adolf Emilio Schwarzenberg (1826–1907)], assayer, Copiapó, Chile, who first called attention to the mineral.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 317–318. (2) Mücke, A. (1970) Schwartzembergite von der Mina Sta. Ana. Neues Jahrb. Mineral., Monatsh., 467–472 (in German with English abs.). (3) Welch, M.D., F.C. Hawthorne, M.A. Cooper, and T.K. Kyser (2001) Trivalent iodine in the crystal structure of schwartzembergite,  $\text{Pb}_5^{2+}\text{I}^{3+}\text{O}_6\text{H}_2\text{Cl}_3$ . Can. Mineral., 39, 785–795.